

Claims

What is claimed is:

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1. An optical switch comprising:

a pair of opposed optical arrays, each optical array including a fixed mirror and a plurality of independently tiltable mirrors;

10 at least one input port for launching a beam of light into the optical switch, said input port being disposed within a respective optical array;

at least two output ports for selectively receiving a beam of light from an optical path between the at least one input port and a selected one of the at least two output ports, said at least two output ports being disposed within a respective opposed optical array; and

15 an ATO element having optical power disposed between the pair of opposed optical arrays.

2. The optical switch as defined in claim 1 wherein the pair of opposed optical arrays is disposed in respective focal planes of the ATO element.

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3. The optical switch as defined in claim 2 wherein the ATO element has a focal length approximately equal to a near zone length or Rayleigh range of a beam of light incident thereon.

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4. The optical switch as defined in claim 2 wherein the at least one input port and the at least two output ports are optical bypasses for allowing a beam of light to pass through a respective one of the pair of opposed optical arrays.

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5. The optical switch as defined in claim 4 wherein the pair of opposed optical arrays, the at least one input port, the at least two output ports, and the ATO element are disposed about an optical axis of the ATO element.

6. The optical switch as defined in claim 5 wherein the fixed mirror of each of the pair of opposed optical arrays is positioned along the optical axis of the ATO element.

5 7. An optical switch comprising:

at least one input port for launching a beam of light into the optical switch;

at least two output ports for selectively receiving a beam of light from an optical path between the at least one input port and a selected one of the at least two output ports;

an ATO element having optical power for performing an angle-to-offset

10 transformation, said ATO element being disposed between the at least one input port and the at least two output ports;

a first array of deflectors including a first fixed deflector and a first plurality of independently tiltable deflectors and a second array of deflectors including a second fixed deflector and a second plurality of independently tiltable deflectors, said first and second
15 array of deflectors being disposed in respective focal planes of the ATO element, wherein the first fixed deflector is for receiving a beam of light from the at least one input port via the ATO element and for deflecting a beam of light to one of the second plurality of independently tiltable deflectors via the ATO element, and the second fixed deflector is
20 for receiving a beam of light from one of the first plurality of independently tiltable deflectors via the ATO element and for deflecting a beam of light to a selected one of the at least two output ports via the ATO element, and wherein the first and the second plurality of independently tiltable deflectors are for switching a beam of light along an optical path via the ATO element.

25 8. The optical switch as defined in claim 7 wherein the ATO element has a focal length approximately equal to a near zone length or Rayleigh range of a beam of light incident thereon.

9. The optical switch as defined in claim 8 wherein the at least one input port, the at least
30 two output ports, the ATO element, the first array of deflectors, and the second array of deflectors are disposed about an optical axis of the ATO element.

10. The optical switch as defined in claim 9 wherein a beam of light passes five times through the ATO element along an optical path between the at least one input port and a selected one of the at least two output ports.

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11. The optical switch as defined in claim 9 wherein the first array of deflectors and the second array of deflectors are disposed on a first MEMS chip and a second MEMS chip, respectively.

10 12. The optical switch as defined in claim 11 wherein the deflectors are micro-mirrors.

13. The optical switch as defined in claim 11 wherein the at least one input port and the at least two output ports are disposed at optical bypass regions of the first and the second MEMS chip, respectively.

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14. The optical switch as defined in claim 7 wherein the ATO element is one of a focusing lens and a GRIN lens

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15. The optical switch as defined in claim 14 wherein the GRIN lens is a quarter pitch GRIN lens.

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16. The optical switch as defined in claim 15 wherein the first array of deflectors is disposed at a first end face of the GRIN lens and the second array of deflectors is disposed at a second end face of the GRIN lens.

17. The optical switch as defined in claim 16 wherein the GRIN lens is a foreshortened GRIN lens for accommodating the first array of deflectors in the first focal plane of the GRIN lens and the second array of deflectors in the second focal plane of the GRIN lens.

30 18. An optical switch comprising:

at least one input port for launching a beam of light into the optical switch;

at least two output ports for selectively receiving a beam of light;

an ATO element having optical power and a focal length approximately equal to a near zone length or Rayleigh range of a beam of light incident thereon; and

a first array of deflectors and a second array of deflectors for switching a beam of light from the at least one input port to a selected one of the at least two output ports, wherein the switching is performed along an optical path including the first and the second array of deflectors and the ATO element and wherein a beam of light passes five times through the ATO element when switching a beam of light to a selected one of the at least two output ports.

19. The optical switch as defined in claim 18 wherein the first array of deflectors includes a first fixed micro-mirror and a first plurality of tiltable micro-mirrors, and the second array of deflectors includes a second fixed micro-mirror and a second plurality of tiltable micro-mirrors.

20. The optical switch as defined in claim 19 wherein the first and the second array of deflectors are disposed in a respective focal plane of the ATO element.